

ON THE ANATOMY OF *VITREA SCHARFFI*.

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SOME ten or eleven years ago Dr. Boycott drew my attention to the existence, at Hereford, of a form of *Vitreæ* having a radula like that of *V. cellaria*, but a shell answering to the description of *V. nitidula*, var. *nitens* (in particular). The preparations were kept, and they undoubtedly belong to the species Mr. Kennard has just described. I have also found examples in my Hereford material collected before that time; and it has also occurred in the material taken by me in the Ross-on-Wye district this last summer. The shell certainly bears a strong superficial resemblance to that of *nitidula*, though the resemblance no doubt seemed greater in the days when one took it for granted that all common *Vitreæ* must be either *cellaria* or *nitidula*. It is not such a resemblance as would deceive the practised eye of Mr. Kennard, but it may account for some of the mistakes which are often made when large numbers of *Vitreæ* have to be sorted. The nicely cleaned cabinet specimen exhibits it less markedly than the living animal, because the combination of colours of skin and shell assists the 'make-up.' The prevailing tint of the animal of *Scharffi* is, however, a dull brown; it is generally more or less flecked with black, but in small patches not forming a pattern or lines.

Mr. Kennard has sent me a number of specimens from the localities he has mentioned, and I have many others yet to be examined. I have, however, gone carefully through the original consignment, and taken samples of the rest. The drawings here given are all from the same specimen—one of the original ones; but the description is equally based on 17 other careful dissections and 22 conducted more hastily. It is now my practice to examine with a 26 mm. objective the texture of all shells that may be called "doubtful *nitidula*": if they present the regular series of parallel concentric striæ which characterises that species, I find it is pretty safe to assume that they are *nitidula*; if not, they are put on one side for further examination, and generally turn out to be *Scharffi*.

Reproductive System (Fig. 1). The ovotestis, in several specimens in which it was minutely examined, had five ducts; in one four only could be found. The acini form a voluminous mass in the specimen figured; further (histological) details will be embodied in a special paper. The hermaphrodite duct is exceptionally long and wide, and but little convoluted, but appears to be provided at several points of its course with valves, originating from a kind of intussusception. The albumen gland is slug-shaped, and the duct joins it in a deep trifid groove at a point above the middle. The epididymis has two and a half complete turns between the albumen gland and the entry of the vas deferens. In specimens which have the oviducal portion distended the epididymis forms a compact suboval organ, but the

number of turns does not seem to be increased. The vagina is long, and divides into two branches above, one being bent upon itself and going to join the oviduct, while the other forms an S-shaped duct for the spermatheca. Judging by the tissue composition of these branches they should be regarded as parts of the vagina proper. There is a small eminence between their roots which may be the vestige of a diverticulum. The spermatheca is spoon-shaped, but the flattened side, which normally is attached to the middle of the epididymis, is thinner and softer than the convex outer surface; and this flattened side is occasionally found distended, causing the spermatheca to



FIG. 1.

assume a more globular form. The vagina is joined to the atrium by a semicircular duct, provided with an oval glandular jacket. The atrium or common duct itself is very short. The lower parts of both male and female organs are in addition enclosed in a loose reticulum of connective tissue, which in some specimens assumes the appearance of a bag, similar to that which is found in the same place in *Vitrina*, though not so well marked. The penis is remarkably long and has two flexures; the part between the flexures is the penis proper. The vas deferens joins the male organ not far from the upper

end; a stout muscle is attached to this upper end, which is coiled and has a termination suggestive of a rudimentary flagellum. The superior dilatation of the vas deferens is unusually large, and presents a sigmoid flexure; a large muscle rises from its lower end.

There is variation in the degree of slenderness or tumidity of the different parts of this apparatus, but the remarkable flexures of the spermathecal duct, vas deferens, and lowest part of the vagina appear to be always present. I think that care should be taken to study these organs in fixed specimens, unless the object is only to make a rapid diagnosis. The use of acid alcohol facilitates the proper separation of the parts.

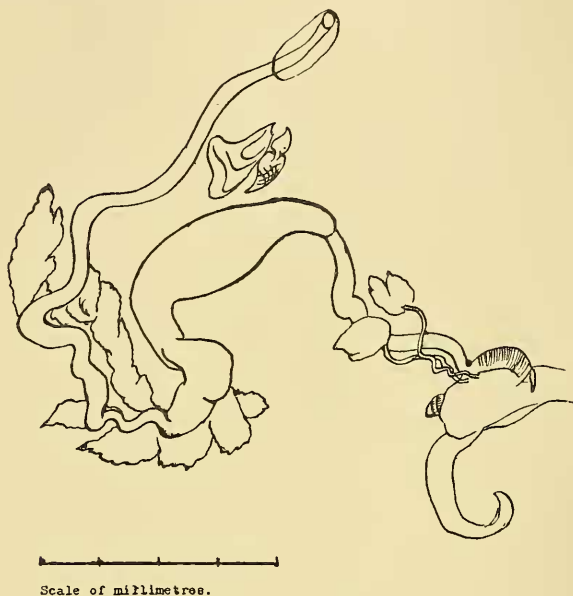


FIG. 2.

The general arrangement of the digestive tract is shown in Fig. 2. The buccal mass resembles that of *V. hibernica*, but is usually more oblongate. The ducts of the salivary glands are long and twisted. The large muscle terminating in the maxilla has a sheath marked with regular transverse striations. Its mode of attachment to the maxilla is somewhat complicated; this organ is shown in Fig. 3. It consists of one-half of a sphincter oris muscle chitinised in two layers. Round this lies a thin margin of chitin which is morphologically continuous with the preoral folds of the epidermis, in which incipient chitinisation may sometimes be seen, though not so clearly as in some species (e.g. in *Agriolimnax agrestis*). The actual 'beak' of the

mandible is not very prominent; it appears to originate by chitinisation of the fibrous ends of the muscle. The short elasma is connected with the sheath of this same muscle. In Fig. 3, A represents the maxilla seen from the back; the W-shaped portion shaded darker, which projects considerably, is the attachment of the muscle. B shows the appearance of the organ as viewed from below; the semicircular foundation is seen through the transparent 'beak.' C shows the maxilla in the aspect in which it is usually figured. It is right to point out that few drawings give any idea of the complexity of this remarkable organ. In the present species it consists of four distinct elements, and in the large *Helices* there are five. It is possible to separate these by carefully treating with sodium hypochlorite. It can then be seen that the odontognath mandible conceals a leiognath or oxygnath one. Calcareous granules are usually to be noticed (unfortunately for microtome knives) in the tissues round the chitin-forming parts, and seem to be in some way concerned with the process, which may be of a degenerative character. I shall be very glad to hear from anyone who is making a study of the chemistry of chitin and the histological processes involved in its deposition.

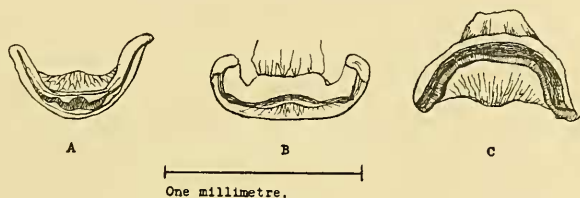


FIG. 3.

Though the glands which discharge into the buccal cavity are called salivary glands, the nature of their secretion does not appear to be accurately known. The large organ in the centre of Fig. 2 (the 'crop') is also provided with glands (not shown). Only a part of the pyloric glandular apparatus is shown in the figure. The nephridium is subtriangular; it has the curious property of staining with borax carmine much more readily than the other tissues. This and the heart are shown here merely to indicate their general position.

Fig. 4 shows the radula, which is probably sufficient for identifying the species. The noticeable points about it are: (a) the small number of marginals; 7 or 8 as against the 10 or 12 usually found in the species of this group. Juvenile specimens of *cellaria* might have only 7 or 8, but their centrals and laterals are of an easily recognisable type. (b) The shortness of the cusps, in consequence of which the rows hardly overlap at all. (c) The transitional or third lateral is only distinguished from the marginals by a very slight bicuspidation. The central teeth resemble those of *V. hibernica*, and the general configuration of the basal plates is also similar. The radular variation,

that I have seen took the form of accessory endocones to central tooth; central and first lateral fused; second lateral with bifid endocones. In two specimens the marginals were much shorter than those figured, and lay huddled together much after the fashion of those of the genuine *nitidula*.

In conclusion, I believe that the great variation in genitalia and radulæ which has been observed within the limits of certain species is due largely to the fact that the species hitherto recognised have been composite. But, if I may borrow a phrase now consecrated by

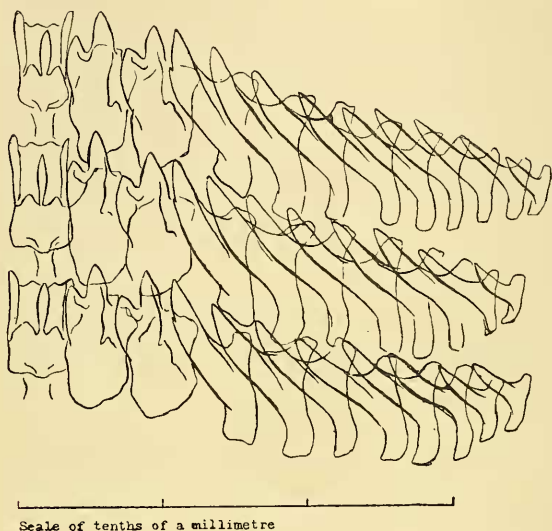


FIG. 4.

official usage, there is such a thing as non-significant variation. Some instances of it have been noted above: but it is only by obtaining a more complete knowledge of the physiology of the snail that we can hope to settle definitely what variations come under this head. One other thing: the *Vitrea* radula has larger teeth than that of any other group except *Testacella*; but to see even *Vitrea* properly a really high power is needed.